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## NOTICE OF ALLOWANCE AND FEE(S) DUE

30596 7590 12/30/2008

HARNESS, DICKEY & PIERCE, P.L.C.  
P.O. BOX 8910  
RESTON, VA 20195

EXAMINER

TANINGCO, ALEXANDER H

ART UNIT

PAPER NUMBER

2882

DATE MAILED: 12/30/2008

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/544,291

08/04/2005

Herbert Bruder

32860-000908/US

9190

TITLE OF INVENTION: VOXEL-DRIVEN SPIRAL RECONSTRUCTION FOR CONE-BEAM COMPUTER TOMOGRAPHY

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1510	\$300	\$0	\$1810	03/30/2009

**THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.**

**THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.**

### HOW TO REPLY TO THIS NOTICE:

#### I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.**

# **PART B - FEE(S) TRANSMITTAL**

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INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

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30596 7590 12/30/2008

**HARNESS, DICKEY & PIERCE, P.L.C.**  
P.O.BOX 8910  
RESTON, VA 20195

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

## **Certificate of Mailing or Transmission**

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/544,291	08/04/2005	Herbert Bruder	32860-000908/US	9190

TITLE OF INVENTION: VOXEL-DRIVEN SPIRAL RECONSTRUCTION FOR CONE-BEAM COMPUTER TOMOGRAPHY

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1510	\$300	\$0	\$1810	03/30/2009

EXAMINER	ART UNIT	CLASS-SUBCLASS
TANINGCO, ALEXANDER H	2882	378-015000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1 \_\_\_\_\_
- (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 \_\_\_\_\_
- 3 \_\_\_\_\_

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies \_\_\_\_\_

4b. Payment of Fee(s); (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number \_\_\_\_\_ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature \_\_\_\_\_

Date \_\_\_\_\_

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Registration No. \_\_\_\_\_

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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10/544,291	08/04/2005	Herbert Bruder	32860-000908/US	9190
30596	7590	12/30/2008	EXAMINER	
HARNESS, DICKEY & PIERCE, P.L.C. P.O.BOX 8910 RESTON, VA 20195			TANINGCO, ALEXANDER H	
			ART UNIT	PAPER NUMBER
			2882	
DATE MAILED: 12/30/2008				

## Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 0 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 0 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

<b>Notice of Allowability</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/544,291	BRUDER ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	ALEXANDER H. TANGCO	2882	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 11/18/2008.
2. ☒ The allowed claim(s) is/are 1-17.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☒ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
  - \* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
  - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
    - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
  - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.

**Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)</li> <li>2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</li> <li>3. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br/>Paper No./Mail Date _____</li> <li>4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br/>of Biological Material</li> </ol> | <ol style="list-style-type: none"> <li>5. <input type="checkbox"/> Notice of Informal Patent Application</li> <li>6. <input type="checkbox"/> Interview Summary (PTO-413),<br/>Paper No./Mail Date _____.</li> <li>7. <input type="checkbox"/> Examiner's Amendment/Comment</li> <li>8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance</li> <li>9. <input type="checkbox"/> Other _____.</li> </ol> |
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## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/18/2008 has been entered.

### **EXAMINER'S AMENDMENT**

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Blair Hoyt 56,205 on 12/18/2008.

The application has been amended as follows:

Claim 11, lines 1-2, "Computer program product including program elements that during operation in a CT unit, execute" has been replaced by - - A computer readable medium configured to execute - -

### ***Allowable Subject Matter***

Claims 1-17 are allowed.

The following is an examiner's statement of reasons for allowance:

With regards to independent claims 1, 10, and 11, the prior art fails to teach or reasonably suggest reconstructing image voxels from the scanned examination object from the output data and reproducing attenuation coefficients of the respective voxel, each image voxel being reconstructed separately from projection data that include a projection angular range of at least  $180^\circ$ , whereby a measured value filtered for each image voxel is accumulated only on the respective voxel, and an appropriate weighting taking place for each voxel considered in order to normalize the projection data used relating to the respective voxel, wherein the approximate weighting takes place on the projection data after interpolating the projection data and before filtering the projection data, the approximate weighting using voxel individual Parker weights, when taken in combination with the other limitations of the claim.

Dependent claims 2-9, 12-15, and 17 are allowable by virtue of their dependency.

With regards to independent claim 16, the prior art fails to teach or reasonably suggest a means for reconstructing image voxels from the scanned examination object from the output data and reproducing attenuation coefficients of the respective voxel, each image voxel being reconstructed separately from projection data that include a projection angular range of at least  $180^\circ$ , whereby a measured value filtered for each image voxel is accumulated only on the respective voxel, and an appropriate weighting taking place for each voxel considered in order to normalize the projection data used relating to the respective voxel, wherein the approximate weighting takes place on the

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projection data after interpolating the projection data and before filtering the projection data, the approximate weighting using voxel individual Parker weights, when taken in combination with the other limitations of the claim.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Response to Arguments***

Applicant's arguments, see pages 7-10, filed 11/18/2008, with respect to claims 1-17 have been fully considered and are persuasive. The rejections of claims 1-17 has been withdrawn.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following patents are cited to further show:

**Hsiao et al. (US 5,253,171)** shows each voxel subcube and its corresponding projection data strip or subset can be processed in parallel with other pairs of voxel subcubes and corresponding projection data strips or subsets, without interference. A bi-level parallel-processor architecture is employed. Backproject/reproject processor in level 0 selectively perform voxel driven backprojection from the projection data strips or

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subsets to the corresponding voxel subcubes, and voxel-driven reprojection from the voxel subcubes to the corresponding projection data strips or subsets. Each backproject/reproject processor operates on data which is independent of the data for the other backproject/reproject processors, so the processors can operate in parallel (Col. 3 Line 55 – Col. 4 Line 55).

**Grass et al. (US 2006/0062346)** shows weighting function depending on a ray geometry of a radiation emitted by the source of radiation; wherein the calculation unit is further constructed to apply the weighting function to the plurality of rebinned projections labelled with the second marker; wherein the calculation unit is further constructed to filter the plurality of weighted rebinned projections labelled with the second marker; wherein the calculation unit is further constructed to calculate a position of the voxel for the respective one of the plurality of filtered weighted rebinned projections labelled with the second marker in the rebinned projection space; wherein the calculation unit is further constructed to determine whether the voxel is projected onto an allowable area in the rebinned projection space on the basis of the function; and wherein the calculation unit is further constructed to normalize the weighting function for the voxel to ensure that weights of all projections from a certain angle sum up to one (Claim 8).

**Zmora (US 5,708,691)** shows a voxel of a subject irradiated with x-rays is divided into an plurality of sub-voxels, and backprojection data is obtained for the sub-voxels. Projection data for the sub-voxels can be weighted before backprojecting, or the projection data can be backprojected and then weighted. With the method



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according to the invention, instead of backprojecting data on a straight line passing through the center of a voxel, the beam passing through the entire voxel is backprojected. Also, the method and system weights the sub-voxels using a space-variant function. The weighting can be applied to discrete sub-voxels or integration can be used with infinitely thin sub-voxels (Abs.).

**Proksa et al. (US 6,285,733)** shows a) rebinning of the measuring data so as to form a number of groups, each group containing a plurality of planes which extend parallel to one another and parallel to the axis of rotation, each plane containing a respective fan beam, b) one-dimensional filtering of the data, produced by the rebinning, of each group in the direction perpendicular to the direction of the planes, and c) reconstructing the spatial distribution of the absorption from the filtered data of different groups c) backprojecting the measured values into the examination zone along the rays along which they have been measured. The contribution of a measuring value to the absorption value of a voxel must then be weighted by a factor which is dependent on the distance between the relevant voxel and the radiation source position (Abs. and Col. 1 Line 65 – Col. 2 Line 10).

**Lai (US 5,960,056)** shows projection data of successive rotation angles are sorted into reordered parallel projections having different spatial positions with respect to the rotating axis. The reordered projections are interpolated to generate interpolated projections having a common spatial position along the rotation axis. The interpolated projections are convolved and backprojected to provide a volumetric image of the object (Abs.).

**Hsieh et al. (US 6,415,013)** shows acquire projection data of a volume of the object; filtering the acquired projection data; and backprojecting the filtered projection data to reconstruct voxels of the volume image. The multislice detector array has a plurality of rows and columns of detector elements and the backprojecting includes interpolating the filtered projection data across both rows and columns of the multislice detector array (Abs.).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEXANDER H. TANINGCO whose telephone number is (571)272-8048. The examiner can normally be reached on Mon-Fri 8:00-4:30 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Alexander H Taningco/  
Examiner, Art Unit 2882

/Edward J Glick/  
Supervisory Patent Examiner, Art Unit 2882